

II.4-SUMPOINT TIME SERIES SUMMING POINT OPERATION

Introduction

The time series summing point Operation accepts any number of input time series and creates a summed begin time increment time series and a summed end time increment time series or optionally; a single volumetric time series representing the mean of the summed begin and summed end time increment time series.

The resultant summed time series or mean time series represents the summed flow from any number of routed upstream flow time series or local area time series. The input time series to be summed may be represented by either a single time series, assumed to be the instantaneous end increment flow, or by 2 time series, the instantaneous begin increment time series and the instantaneous end increment time series.

The Streamflow Simulation and Reservoir Regulation (SSARR) model represents flow at any point with a begin time increment time series and an end time increment time series. This representation of flow is required to conserve volume in time and space. The basis of routing flow through watershed, river channel and reservoir components of the SSARR model is the law of continuity expressed in the storage equation:

$$t(I1 + I2)/2 - (O1 - O2)/2)t = S2 - S1$$

where I1 is the inflow at the beginning of the compute period
I2 is the inflow at the end of the compute period
O1 is the outflow at the beginning of the compute period
O2 is the outflow at the end of the compute period
S1 is the storage at the beginning of the compute period
S2 is the storage at the end of the compute period
t is the time duration, compute period length

A use of this Operation is illustrated in Figure 1. Flow at a downstream station (S2) is defined as the sum of flows from a local area (L) and the SSARR routed flow from an upstream station (S1). In this case, the flow from the local area is represented by a single end of increment time series. The SSARR routed flow is represented by begin and end increment time series. To obtain the summed flow at the downstream station a begin increment time series for the local area is first created from the end increment time series of the local area. The begin and end time series of the local area and of the SSARR routed flow are then summed to obtain the begin and end time series for the downstream point.

The relationship between the begin and end increment flow time series for this example may be represented as in Figure 2 and as follows:

S1RB(1) is the first element of the begin increment routed flow time series at station S1 at time t1
S1RE(1) is the first element of the end increment routed flow time series at station S1 at time t1

LE(1) is the first element of the assumed end increment flow time series of the local area at time t1
 LB(1) is the first element of the created begin increment flow time series of the local area at time t1
 S2B(1) is the first element of the begin increment flow time series at station S2 at time t1
 S2E(1) is the first element of the end increment flow time series at station S2 at time t1

For the SSARR routed flow from the upstream station S1:

S1RB(1) S1RB(2) . . . S1RB(n-1) S1RB(n)
 S1RE(1) . . . S1RE(n-2) S1RE(n-1) S1RE(n)

For the local area from Operation UNIT-HG where only the end increment time series is specified:

LE(1) LE(n-2) LE(n-1) LE(n)

The begin increment local area time series is created from the end increment time series as:

LB(1) LB(2) LB(n-1) LB(n)

where LB(1) is set according to the input carryover parameter (CARY) for the LE time series

If CARY for time series LE is:

'CARY' then LB(1) is read from carryover
 'FLAT' then LB(1) = LB(2) = LE(1)
 'ZERO' then LB(1) = 0
 'VALU' then LB(1) is read from input

Once all of the input begin and end increment time series are defined, each of the input begin increment time series are summed. Similarly, each of the input end increment time series are summed. The flow at station S2 therefore becomes:

S2E(n) = SUM(S1RE(n), LE(n))
 S2B(n) = SUM(S1RB(n), LB(n))

where n = 1 to the number of elements

The above illustration is limited to the summing of flows from 2 sources. However, there is no limit to the number of input begin and end increment time series that can be summed. The begin and end increment time series are both used for any SSARRESV Operation while only the end increment time series or the mean time series may be used for other Operations which use a single time series to represent flow.

Figure 1. Use of Operation SUMPOINT

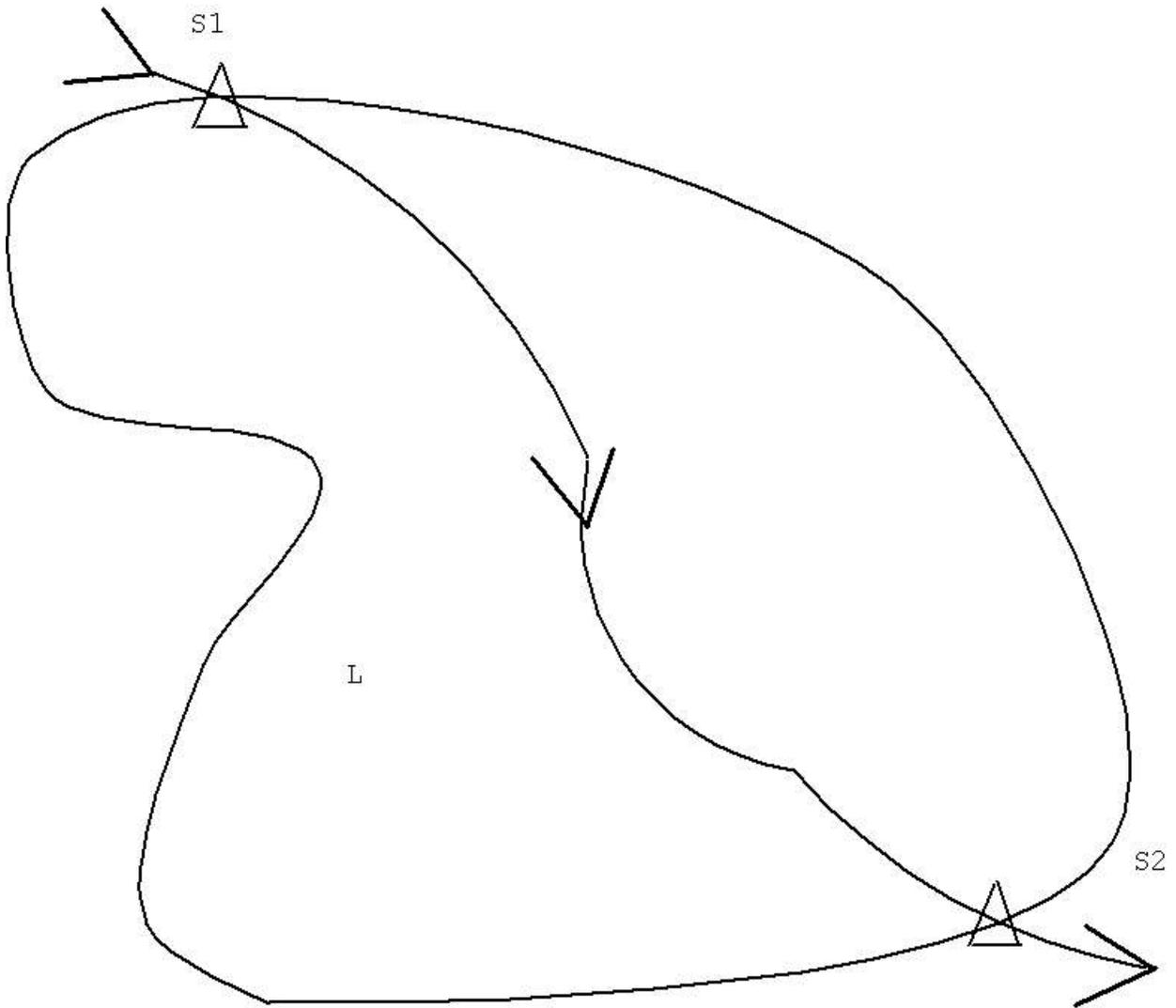


Figure 2. Relationship between begin and end increment flow time series

